Lateral boundary conditions for the Klein-Gordon-Fock equation

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Abstract: In this paper we consider an initial-boundary value problem for the Klein-Gordon-Fock equation. In [1], Authors considered one dimentional potential

$$u(x,t)=\int_{\Omega}(-\frac{1}{2}|x-y|)f(y)dy \tag{1.1}$$

in $\Omega=(0,1)$ and the equation

$$-u^{"}(x)=f(x),\ \ x\in\Omega, \tag{1.2}$$

and they showed that if they are solved the equation (1.2) with the boundary conditions

$$u^{'}(0)+u^{'}(1)=0,\ \ -u^{'}(1)+u(0)+u(1)=0. \tag{1.3}$$

then they were finded an unique solution of that boundary value problem in the form (1.1).

This simple method finds equivalent boundary value problems of ODE for one dimensional potential integrals. However this task becomes tedious for PDE, and in works [1,2] are obtained boundary conditions of the volume potentials for elliptic and hyperbolic equations and showed some their applications. In particular, in [2], by using a new non-local boundary value problem, which is equivalent to the Newton potential, Authors found explicitly all eigenvalues and eigenfunctions of the Newton potential in the 2-disk and the 3-ball. The aim of this work is to find lateral boundary conditions for the Klein-Gordon-Fock equation as shown in [1].

Keywords: Potential, fundamental solution, Klein-Gordon-Fock equation

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References

[1] Kal'menov T.Sh. , Suragan D., "Initial-boundary value problem for the wave equation", *Electron. J. Diff. Equ.*, Vol. 48, pp. 1-6, 2014.

[2] Kal'menov T.Sh. , Suragan D., "To spectral problems for the volume potential", *Doklady Mathematics*, Vol. 80, No. 2, pp. 646-649, 2009.